COURSE OUTLINE

BED HPERS

PES 241: EXERCISE PHYSIOLOGY

University of Education, Winneba

Acknowledgements

The course instructor of PES 241: Exercise Physiology, wishes to thank the following personalities for their contribution to this COURSE OUTLINE

Dr. Henry Pufaa — HOD- HPERS

Dr. Jonathan Ammah — Former Dean Faculty of Science Education

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About this Course Outline

PES 241 has been produced by The University of Education, Winneba. All as produced by The University of Education, Winneba are structured in the same way, as outlined below.

RATIONALE AND DESCRIPTION

A study of the physiological responses and adaptations to exercise as related to human performance limitations, training effects and health related benefits. Emphasis is given to the cardiovascular basis of such phenomena, interrelating topics such as circulatory physiology, energy production (athletic nutrition), fatigue, and aids that are impediments to athletic performance.

How this Course Outline is structured

The course overview

Upon the completion of the course, the student will be able to:

1. Explain the meaning of Exercise Physiology and tell its importance
2. Define the terms HEMEOSTASIS and STEADY STATE and explain NEGATIVE FEEDBACK.
3. Give the physiological explanation for the observation that the oxygen debt is greater following intense exercise when compared to the oxygen debt following light exercise.
4. Define the terms CONCENTRIC and ISOMETRIC contractions and their effectiveness in movement
5. Give an overview of the design and function of the circulatory system
6. Outline the circulatory responses to various types of exercise
7. Discuss the regulation of cardiac output during exercise
8. Define the four processes of heat loss during exercise
9. Describe the effects of carbohydrate diets on muscle glycogen and on endurance performance during heavy exercise
10. Describe the process of adaptation to altitude, and the degree to which this adaptation can be complete.

11. Define ergogenic aid, and describe blood doping and its potential for improving endurance performance
12. Describe the physiological and psychological effects of different types of warm-ups.

The course content

1. What is Exercise Physiology? What is the importance of exercise physiology?
2. Control of the internal environment
3. Skeletal muscle: Structure and function
4. Respiration during exercise
5. The nervous system – structure and control of movement
6. Exercise metabolism
7. Temperature Regulation
8. The circulatory system and exercise
9. Factors affecting performance
10. Training for performance
11. Nutrition, body composition and performance
12. Fuels for exercise
13. The physiology of training
14. Environment and exercise
15. Ergogenic Aid

Recommended Text

Arnould-Taylor, W.E. (1988), A textbook of Anatomy and Physiology (2nd ed.) Cheltenham, UK, Stanley Thomas (Publishers) Ltd.

Fox, E, Bowers & Foss M, (1995), The Physiological Basis foe Exercise and Sport (5th ed.) Madison; Brown and Benchmark Publishers

Gensemer, R.E. (1995), Physical Education (Perspective inquiry, application)(3rd ed.) Madison: Brown and Benchmark Publishers.

Lamb, D (1984), Physiology of exercise (Responses and Adaptations) (2nd ed) New York N.Y.; Mac Millian Publishing Company

Powers, S.K. & Howley E.T. (2001), Exercise Physiology (Theory and Application to fitness and Performance (4th ed.). New York N.Y.; Mc Graw-Hill

Thompson, P.J.I .., (1991), Introduction to coaching theory; IAAF Coaches Education and Certification System, West Sussex UK, I & S Printing Company Ltd.

Course Requirements

EXAMINATION

Students will be assessed periodically in the course of the semester. The instructor shall inform students of any impending assessment. In addition to the continuous assessment there will be an end of semester examination. Students who fail to do their assignment or show up for examination will not be allowed to make up, except on medical grounds with a medical report from a recognized physician.

ATTENDANCE

Attendance will be checked before the start of each session. Students are expected to attend all class sessions. Students will be allowed only two absences during the period. Subsequent absences shall attract a point deduction from total points made in course work.

TARDINESS

Lateness to lectures will not be tolerated. Students who are late twice for lectures will be counted as one absence.

EVALUATION PROCEDURES

Continuous Assessment (quizzes, assignments etc) ……
40%

End of semester Examination
60%

ACADEMIC DISHONESTY

Academic dishonesty will not be allowed. Any form of academic misconduct (cheating etc) will not be tolerated. All cases of confirmed or suspected dishonesty will be referred to the Departmental Academic Board and eventually to the University's Academic board

Resources

For those interested in learning more on this subject, we provide you with a list of additional resources at the end of this Course outline; these may be books, articles or web sites.

Your comments

After completing PES 241 we would appreciate it if you would take a few moments to give us your feedback on any aspect of this course. Your feedback might include comments on:

- Course content and structure.
- Course reading materials and resources.
- Course assignments.
- Course assessments.
- Course duration.
- Course support (assigned tutors, technical help, etc.)

Your constructive feedback will help us to improve and enhance this course.

Timeframe

How long?

Fourteen weeks

Study skills

INSTRUCTIONAL STRATEGIES

Lectures, discussions, and class activities to be employed to achieve the stated objectives

As an adult learner your approach to learning will be different to that from your school days: you will choose what you want to study, you will have professional and/or personal motivation for doing so and you will most likely be fitting your study activities around other professional or domestic responsibilities.

Essentially you will be taking control of your learning environment. As a consequence, you will need to consider performance issues related to time management, goal setting, stress management, etc. Perhaps you will also need to reacquaint yourself in areas such as essay planning, coping with exams and using the web as a learning resource.

Your most significant considerations will be *time* and *space* i.e. the time you dedicate to your learning and the environment in which you engage in that learning.

We recommend that you take time now—before starting your self-study—to familiarize yourself with these issues. There are a number of excellent resources on the web. A few suggested links are:

- http://www.how-to-study.com/

  The "How to study" web site is dedicated to study skills resources. You will find links to study preparation (a list of nine essentials for a good study place), taking notes, strategies for reading text books, using reference sources, test anxiety.

- http://www.ucc.vt.edu/stdysk/stdyhlp.html

  This is the web site of the Virginia Tech, Division of Student Affairs. You will find links to time scheduling (including a "where does time go?" link), a study skill checklist, basic concentration techniques, control of the study environment, note taking, how to read essays for

analysis, memory skills (“remembering”).

- http://www.howtostudy.org/resources.php

  Another “How to study” web site with useful links to time management, efficient reading, questioning/listening/observing skills, getting the most out of doing (“hands-on” learning), memory building, tips for staying motivated, developing a learning plan.

The above links are our suggestions to start you on your way. At the time of writing these web links were active. If you want to look for more go to www.google.com and type “self-study basics”, “self-study tips”, “self-study skills” or similar.

Assignments

Assignments

There will be two assignments: a group and an individual

Assessments

Assessments

There will two assessments

One at mid semester and the other at the end of the semester

Getting around this Course Outline

Margin icons

While working through this course outline you will notice the frequent use of margin icons. These icons serve to "signpost" a particular piece of text, a new task or change in activity; they have been included to help you to find your way around this course outline

A complete icon set is shown below. We suggest that you familiarize yourself with the icons and their meaning before starting your study.

 Activity	 Assessment	 Assignment	 Case study
 Discussion	 Group activity	 Help	 Note it!
 Outcomes	 Reading	 Reflection	 Study skills
 Summary	 Terminology	 Time	 Tip

Unit 1 What is Exercise Physiology


Outcomes

Upon completion of this lesson you will be able to:

- explain what is meant by exercise, identify the types of exercise and tell its benefits to the **body**
- Define physiology and mention its sub-divisions
- Explain exercise physiology and tell its relevance in the profession of the physical educator or sports coach

Terminology

Exercise:	[the act of performing physical activity for health and sports performance]
Physiology	The mechanical, physical and biochemical functions of living organisms
Physical fitness	a person's ability to work effectively and efficiently]
Responses	Sudden and temporary functional changes caused by exercise
Training	A systematic process with the objective of improving an athlete's fitness in a selected activity
Adaptations	Persistent structural and functional changes following training
Anaerobic exercise	Involves intense or explosive sports or strenuous exercises

Assignment

EXERCISE PHYSIOLOGY

- Exercise means different things to different people – callisthenics, long walk, running, playing a game etc. It is seen as a wide range or variety of physical education.

- Exercise is the act of performing a physical activity or the act of putting stress to bear on the body. Exposing the body to a stimulus.

- Exercise is the performance of movements in order to develop or maintain physical fitness and overall health. It is often directed toward also honing athletic ability or skill. Frequent and regular physical exercise is an important component in the prevention of some of the diseases of affluence such as cancer, heart disease, cardiovascular disease, Type 2 diabetes, obesity and back pain.

Exercises are generally grouped into three types depending on the overall effect they have on the human body.

FLEXIBILITY EXERCISES

- Flexibility exercises such as stretching improve the range of motion of muscles and joints.

AEROBIC EXERCISE

- Aerobic exercises such as walking and running focus on increasing cardiovascular endurance and muscle density.

- Aerobic exercise is any activity which is rhythmic in nature that uses large muscle groups and can be maintained continuously. The type of exercise in which the muscles draw on oxygen in the blood as well as fats and glucose that increase cardiovascular endurance.

- Type of exercise that overloads the heart and lungs and causes them to work harder than at rest.

DIFFERENT TYPES OF AEROBIC EXERCISE

Brisk walking, jogging, bicycling, swimming, aerobic dancing, racket sports (tennis, squash, table tennis, badminton), rowing, ice or roller skating, cross-country, exercise on aerobic equipment such as treadmill, bicycle ergo meter.

ANAEROBIC EXERCISES

- Anaerobic exercises such as weight training or sprinting increase muscle mass and strength.

- Anaerobic exercises Involves intense or explosive sports or strenuous activity that leaves one gasping for breath.

- An exercise that can only be done for a minute or two at a time, because it depends on limited store of glycogen sugar stored in the muscles that is rapidly depleted, resulting in intense muscle fatigue.

BENEFITS OF PHYSICAL EDUCATION

- Maintaining physical fitness including healthy weight.
- Building and maintaining healthy bones, muscles and joints.
- Promoting physiological well-being.
- Reducing surgical risks.
- Strengthening the immune system.

PHYSIOLOGY - Is the study of the functions of the body as a whole and of the structures and organs found inside.

“physis” meaning nature or origin.

“logos” meaning speech or to talk about the nature.

It is the study of the mechanical, physical, and biochemical functions of living organisms.

EXERCISE PHYSIOLOGY - It is what happens to the body as it exercise a single time, how these changes in function are brought about, what changes in function occur after repeated bouts of exercise and how these changes come to pass, and finally, what can be done to improve the body’s response to exercise and its adaptation to repeated bouts of exercise.

Exercise physiology is the description and explanation of functional changes brought on by single (acute) or repeated bouts of exercise (chronic exercise or training), often with the objective of improving the exercise response.

Description of functional changes deals with what happens to the body.

Explanation also deals with the understanding of how these changes occur e.g. how the nervous system coordinates movement; and the application of the knowledge to develop training programme(s).

Exercise physiology is the identification of physiological mechanisms underlying physical activity, the comprehensive delivery of treatment services concerned with the analysis, improvement, and maintenance of health and fitness, rehabilitation of heart disease and other chronic diseases and/or disabilities, and the professional guidance and counsel of athletes and others interested in athletics, sports training and human adaptability to acute and chronic exercise".

SCOPE

Deals with such areas as – cardio-respiratory responses to exercise, muscle fiber types, metabolism and body composition assessment.

We are concern with two things:

Enhancement of health, physical fitness of the general population.

Improvement of athletic performance.

PHYSICAL FITNESS

It is the ability to function efficiently and effectively. It is associated with a person's ability to work effectively, enjoy leisure time, be healthy, resist hypokinetic diseases, and meet emergency situations.

It is used in two close meanings: general fitness (a state of health and well-being) and specific fitness (a task-oriented definition based on the ability to perform specific aspects of sports or occupations).

HEALTH-RELATED COMPONENTS

- Body composition
- Cardiovascular endurance
- Muscular endurance
- flexibility
- Strength.

SKILL-RELATED COMPONENTS

- Agility
- Balance
- Coordination
- Power
- Reaction time
- Speed.

RESPONSES AND ADAPTATIONS

Exercise results in responses and adaptations depending on TIME, TYPE, INTENSITY and FREQUENCY. A single bout of exercise is called ACUTE EXERCISE, whereas repeated bouts of exercise over several days or months may be called CHRONIC EXERCISE.

Exercise or practice can also indicated a single episode exercise and training repeated bouts or chronic exercise.

TRAINING - It is the systematic process with the objective of improving on athletes fitness in a selected activity. It is a long term process that is progressive and recognizes the individual athlete's needs and capabilities. Training programmes use exercise or practice to develope the qualities required for an event.

Functional changes that occur with training do not necessarily occur with a single bout of exercise. An example here is that a single bout of exercise does not affect one's resting heart rate, where as regularly endurance training usually reduces the resting heart rate.

RESPONSES - are the sudden, temporary changes in function caused by exercise. These functional changes disappear shortly after the exercise period is over. Example increase in heart rate, rise in blood pressure, increase in breathing.

Adaptations are the persistent changes in structure or function following training that apparently enables the body to withstand repeated bouts of exercise. Adaptations are long term and are thus not seen until several weeks of training. Example reduction of heart rate for sub maximal exercise load. This allows the heart to pump the same amount of blood to the working muscles at a lower energy cost for the heart.

Another example is increased muscle size after strenuous weight lifting programme. The litter exerts greater muscular force than before training. Much of the increased strength persists for many months after the training programme ends.

IMPORTANCE, WHY STUDY EXERCISE PHYSIOLOGY IN PE

- To answer questions on WHY, HOW of things
- Improvement in athletic performance.
- To select physical activities.
- To get information about sex differences, age differences, the effect of exercise on male and female.
- To explain types of exercise for different sexes, age groups etc.

- Enhancement of health, physical fitness of the general population.
- Improvement of athletic performance.

Unit summary

Summary

In this unit you discussed the following:

what is meant by exercise, types of exercise and the benefits of exercise to the body

what is physiology and exercise physiology and its importance to the physical education teacher

physical fitness and its components

the effects of exercise and training on the physiological systems

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